# Claims

[c1] 1. An optical fiber splice protection apparatus for use in an optical fiber hydrophone assembly, the hydrophone assembly having a longitudinal axis and comprising a plurality of mandrels having cylindrical walls that are helically wrapped with optical fiber and connected in linear relation, the hydrophone assembly being in a module filled with module fill fluid, the fiber splice comprising two loose fiber ends spliced and disposed within a fusion splice sleeve, the fiber splice protection apparatus comprising:

a splice protector affixed to a mandrel, the splice protector having a longitudinal axis aligned with the longitudinal axis of the hydrophone assembly and a cavity adapted to receive the fusion splice sleeve; and

a rotation sleeve for winding excess fiber onto the mandrel, the rotation sleeve mounted on the mandrel between the splice protector and an adjacent mandrel, the rotation sleeve having a longitudinal axis aligned with the longitudinal axis of the hydrophone assembly and a groove to receive the fiber and maintain the fiber"s minimum bend radius,

wherein the cavity and the groove each comprise a recessed area defined by two opposing shoulders.

[c2] 2. An optical fiber splice protection apparatus as recited in claim 1, wherein the rotation sleeve is rotatably mounted on the mandrel.

[c3] 3. An optical fiber splice protection apparatus as recited in claim 1, wherein the rotation sleeve is fixedly mounted on the mandrel.

[c4] 4. An optical fiber splice protection apparatus as recited in claim 1,

wherein the splice protector is substantially semi-circular in cross-section.

[c5] 5. An optical fiber splice protection apparatus as recited in claim 1, wherein the rotation sleeve is substantially semi-circular in cross-section.

[c6] 6. An optical fiber splice protection apparatus as recited in claim 1, wherein the splice protector cavity is substantially aligned with the longitudinal axis of the splice protector and is central to the body of the splice protector.

[c7] 7. An optical fiber splice protection apparatus as recited in claim 1, wherein the rotation sleeve cavity is aligned at its longitudinal center with the longitudinal axis of the rotation sleeve and is central to the body of the rotation sleeve.

[c8] 8. An optical fiber splice protection apparatus as recited in claim 1, wherein the splice protector and the rotation sleeve are polyurethane.

[c9] 9. An optical fiber splice protection apparatus as recited in claim 8, wherein the polyurethane is 78-D durometer.

[c10] 10. An optical fiber splice protection assembly for use in an optical fiber hydrophone assembly, the hydrophone assembly having a longitudinal axis and comprising a plurality of mandrels helically wrapped with optical fiber and connected in linear relation, the hydrophone assembly being in a module filled with module fill fluid, the fiber splice protection assembly comprising:

a mandrel having cylindrical walls;

two optical fiber ends spliced together and a length of loose excess optical fiber between the splice and in situ optical fiber at each end of adjacent mandrels;

a fusion splice sleeve installed around the spliced portion of the optical fiber ends;

a splice protector affixed to the mandrel, the splice protector having a longitudinal axis aligned with the longitudinal axis of the hydrophone assembly and a cavity adapted to receive the fusion splice sleeve; and

a rotation sleeve for winding excess fiber onto the mandrel, the rotation sleeve mounted on the mandrel between the splice protector and an adjacent mandrel, the rotation sleeve having a longitudinal axis aligned with the longitudinal axis of the hydrophone assembly and a groove to receive the fiber and maintain the fiber"s minimum bend radius, wherein the cavity and the groove each comprise a recessed area defined by two opposing shoulders.

[c11] 11. An optical fiber splice protection assembly as recited in claim 10, wherein the rotation sleeve is rotatably mounted on the mandrel.

[c12] 12. An optical fiber splice protection assembly as recited in claim 10, wherein the rotation sleeve is fixedly mounted on the mandrel.

[c13] 13. An optical fiber splice protection assembly as recited in claim 10, wherein the splice protector is substantially semi-circular in cross-section.

[c14] 14. An optical fiber splice protection assembly as recited in claim 10, wherein the rotation sleeve is substantially semi-circular in cross-section.

[c15] 15. An optical fiber splice protection assembly as recited in claim 10, wherein the mandrel has a hole through its wall, whereby module fill fluid fills the mandrel to make the mandrel acoustically insensitive.

[c16] 16.An optical fiber hydrophone assembly having a longitudinal axis and comprising:

a plurality of mandrels having cylindrical walls and helically wrapped with optical fiber and connected in linear relation, the hydrophone assembly being in a module filled with module fill fluid;

two optical fiber ends spliced together and a length of loose excess optical fiber between the splice and in situ optical fiber at each end of adjacent mandrels;

a fusion splice sleeve installed around the spliced portion of the optical fiber ends;

a splice protector affixed to a mandrel proximate to the fusion splice sleeve, the splice protector having a longitudinal axis aligned with the longitudinal axis of the hydrophone assembly and a cavity adapted to receive the fusion splice sleeve; and

a rotation sleeve for winding excess fiber onto the mandrel, the rotation sleeve mounted on the mandrel between the splice protector and an adjacent mandrel, the rotation sleeve having a longitudinal axis aligned with the longitudinal axis of the hydrophone assembly and a groove to receive the fiber and maintain the fiber"s minimum bend radius, wherein the cavity and the groove each comprise a recessed area defined by two opposing shoulders.

[c17] 17. A method for protecting spliced optical fibers for use in an optical fiber hydrophone assembly, the hydrophone assembly having a longitudinal axis and comprising a plurality of mandrels helically wrapped with optical fiber and connected in linear relation, the hydrophone assembly being in a module filled with module fill fluid, the optical fibers comprising two free ends and a length of loose excess optical fiber between the free ends and in situ optical fiber at each end of adjacent mandrels, the method comprising:

installing a fusion splice sleeve over one of the free optical fiber ends;

fusion splicing the fibers;

placing and securing the fusion splice sleeve over the splice;

bonding a splice protector to the mandrel, the splice protector having a longitudinal axis aligned with the longitudinal axis of the hydrophone mandrel and a cavity adapted to receive the fusion splice sleeve;

placing the spliced fiber in at least one rotation sleeve to one side of the splice protector;

rotating the rotation sleeve to wind excess fiber around the mandrel, the rotation sleeve having a groove to receive the fiber and maintain the fiber"s minimum bend radius, the groove aligned with the longitudinal axis of the hydrophone mandrel and adapted to receive the fiber that passes therethrough; and

bonding the rotation sleeve to the mandrel;

wherein the cavity and the groove each comprise a recessed area defined by two opposing shoulders.

[c18] 18. A method for protecting spliced optical fibers as recited in claim 17, further comprising the step of breaching the mandrel by making a hole in

the cylindrical wall of the mandrel, whereby module fill fluid fills the mandrel, making the mandrel acoustically insensitive.